

CONCRETE FORMING PANEL HAVING BUILT-IN RETAINING
STRUCTURE FOR STORING LOOSE COUPLING PARTS

5 RELATED APPLICATION

[0001] This application is a continuation-in-part of prior co-pending application S.N. 09/791,399 filed February 23, 2001 titled Method and Apparatus for Retaining Separable Coupling Parts for Concrete Forming Panel.

10 TECHNICAL FIELD

[0002] This invention relates to concrete forming panels and, more particularly, to a concrete forming panel that is provided with built-in structure for safely and securely retaining and storing separate, loose coupling parts which may be used in connecting the forming panel with other panels to make a form.

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BACKGROUND OF INVENTION

[0003] Forming panels used in erecting concrete walls for structures are often provided in standard sizes and shapes, and thus must be connected in order to establish a pair of opposed forming walls into which concrete may be poured for hardening into the final structural shape. Thus, adjacent forming panels are coupled together by pins, wedges and other fasteners, and opposing walls are connected by tie bars and the like. The purpose of such forms is that they may be removed and reused after the concrete is hardened. However, keeping track of the large number of pins, wedges, nuts and other connectors has been a problem. One other problem associated with such small parts is that they are often not readily available to the workman who must assemble the forms. Thus, parts may be lost or displaced, located in a remote area on the jobsite, or otherwise separated from the forming panel. Certain parts are relatively specialized and thus somewhat expensive to replace, and are repeatedly used with the same forming panel. Moreover, several workman must often wait while the parts are obtained by another workman, resulting in the loss of productive time of not merely one but several workers. Thus, the expense of replacement parts and the time lost in locating and retrieving such small parts is an economic loss as well as an aggravation to the construction crew.

[0004] While the forming panels include a plurality of coupling sites which are normally adapted to receive some or all of the parts for use in, for example, attaching the forming panel to a complementally configured forming member, it is unsatisfactory to carry the separate parts in these

locations during transit and storage. Typically, these "in use" positions are exposed, and placing the parts in these coupling sites subjects the parts, and more importantly the forms themselves which are often of a softer material, to substantial use and wear as the parts are impacted. Moreover, holding the parts in such "in use" positions interferes with handling and positioning the forms for coupling 5 as well as storage. In addition, such "in use" positions in the coupling sites subjects the parts themselves to impact and loosening at the site, whereby parts may be readily separated and lost.

[0005] One attempt to ameliorate this problem has been to attach small parts by wires to the forming panel. This helps to keep certain parts constant associated with a single form. However, the wire connecting the parts to the form may become entangled with other equipment resulting in 10 a potential safety hazard. In addition, when two or more such small parts are used at a single location, the positioning of the wires may be cumbersome. Also, not all parts will be coupled to a form, or certain special applications may require different small parts to couple the forms together.

[0006] There has thus developed a need for improved methods of storing small parts in safe and convenient locations on concrete forming panels during periods of nonuse, and in particular 15 aluminum forming panels of a lightweight type of construction.

SUMMARY OF INVENTION

[0007] These problems have largely been solved by the panel of the present invention. By having parts-holding structure built into the form itself, the parts are always conveniently available 20 for use. Moreover, by having the parts retaining structure spaced from the coupling sites and disposed safely within the overall profile of the panel, the parts may be securely held by the retaining structure even during rough handling, storage, and alignment of adjacent forms, so that the parts do not interfere with such alignment but may be quickly transferred to the coupling sites when desired.

[0008] Broadly speaking, the forming panel of the present invention includes a face sheet 25 having a front side for receiving concrete thereagainst, a frame for supporting the face sheet and projecting rearwardly from the back side, and parts retaining structure on the back side of the face sheet for temporarily holding one or a plurality of separate and discrete parts. By "separate", it is meant that the parts are not held by a wire or other permanent attachment to the forming panel, but rather are completely separable therefrom so that parts may be readily transferred between different 30 forming panels as desired for specific applications. In a preferred form of the invention, the parts retaining structure includes one or more annular brush rings having generally radially inwardly projecting bristles that terminate in innermost free ends to define a receiving and retaining hole for the coupling part. The bristles of the retaining ring are resilient so that as a part is forced into the

hole, the bristles deflect and yield as necessary to accommodate the part yet maintain a firm surrounding grip thereon. In a preferred form of the invention, the retaining rings are supported by stiffening members of the frame that reinforces the face sheet.

[0009] These and other advantages will be readily apparent to those skilled in the art with reference to the drawings and description which follow.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a rear perspective view of a forming panel having a face sheet, a frame, and a plurality of parts receivers for receiving discrete parts;

[0011] Fig. 2 is a fragmentary enlarged rear perspective view of the forming panel hereof showing a parts receiver having a plurality of circular openings and two parts positioned for receipt in the openings;

[0012] Fig. 3 is an enlarged horizontal cross-sectional view taken along line 3-3 of Fig. 2 showing a pin received in a gripper placed in an opening of a parts receiver;

[0013] Fig. 4 is an enlarged horizontal cross-sectional view taken along line 4-4 of Fig. 2 showing a wedge received in a gripper placed in an opening of a parts receiver;

[0014] Fig. 5 is an enlarged horizontal cross-sectional view taken along line 5-5 of Fig. 1 showing a parts receiver having a plurality of holes and spanning between two horizontal stiffening members of the frame in reinforcing relationship to the face sheet;

[0015] Fig. 6 is an enlarged horizontal cross-sectional view taken along line 6-6 of Fig. 1 showing a parts retainer having a grip and loop fabric material for temporarily and releasably holding a part thereto;

[0016] Fig. 7 is an enlarged horizontal cross-sectional view taken along line 7-7 of Fig. 1 showing a parts retainer having a magnet section for temporarily and releasably holding a part thereto;

[0017] Fig. 8 is a fragmentary enlarged rear perspective view of an alternate embodiment of the forming panel hereof showing a parts receiver having a wing to which a flexible strip is attached for gripping a part;

[0018] Fig. 9 is an enlarged, fragmentary, rear perspective view of another embodiment employing brush rings for retaining the loose parts;

[0019] Fig. 10 is an enlarged, fragmentary, side elevational view of the Fig. 9 embodiment with portions broken away and shown in cross-section to reveal details of construction;

[0020] Fig. 11 is an enlarged, transverse cross-sectional view of the Fig. 9 embodiment taken substantially along line 11-11 of Fig. 10;

[0021] Fig. 12 is an enlarged perspective view of one of the brush rings;

[0022] Fig. 13 is an enlarged, fragmentary cross-sectional view similar to Fig. 11 but showing 5 a coupling pin received and retained by one of the brush rings; and

[0023] Fig. 14 is an enlarged, fragmentary cross-sectional view similar to Fig. 11 but showing the use of a pair of brush rings mounted on opposite sides of the wall of a stiffening member of the panel.

10 THE EMBODIMENTS OF FIGS. 1-8

[0024] Referring now to the drawings, a forming panel 10 for receiving flowable concrete thereagainst and providing a form for hardening the concrete to a desired shape is generally shown in Fig. 1 and includes a face sheet 12 and a frame 14. The face sheet and frame are provided preferably primarily of aluminum, to include alloys thereof such as ASTM 6061-T6. The face sheet 15 12 is relatively thin, for example about .090 to .125 for lightweight applications but may be made thicker for heavier duty applications, and may be substantially flat or textured to provide a brickface or other texture to the concrete hardening thereagainst. The face sheet 12 includes a perimeter 15, a front side 16 and a back side 18, and is welded to the frame 14.

[0025] The frame 14 has at least one rail of a thickness typically varying between .125" and 20 3/8" for lightweight applications, with thicker aluminum stock provided for larger sizes and heavier duty applications if desired. The frame 14 may be round, oval, polygonal or any other shape as desired, but it is most common to provide a frame 14 having a generally rectangular shape with a pair of parallel, spaced-apart end rails 20 and 22 and a pair of parallel, spaced-apart side rails 24 and 26 which are welded together to provide the support and shape desired for the face sheet 12 as shown 25 in Fig. 1. Stiffeners 28 may be provided as a part of the frame 14 and located on the back side of the face sheet 12.

[0026] In addition, the present invention includes at least one parts receiver 30. Some of the 30 rails, such as side rails 24 and 26, have coupling sites 32. As shown in Fig. 1, the coupling sites 32 typically include a hole 34 and a relieved area 36. The holes 34 may receive a part 37, such as a pin 38 therein, which can be held by a wedge 40 to couple the forming panel to an adjacent forming structure, such as another panel, corner member, or the like. The relieved areas may have tie-bars placed therealong to connect the forming panels 10 to opposite forming structures.

[0027] The parts receiver 30 of the present invention may be provided in different configurations. One example of such a parts receiver 30 is a cross-member 42 extending between the side rails 24 and 26 including a plurality of elongated openings 44 in a first bar 46 extending generally perpendicular to the face sheet 12 and further supported and reinforced by a second bar 48 oriented generally parallel to the face sheet 12. In addition, a plurality of circular openings 50 are provided in the first bar 46 of the cross-member 32.

[0028] Either or both of the openings 44 and 50 may be provided with grippers 52 inserted therein which are formed of an elastomeric material such as natural or synthetic rubber and which enhance the frictional engagement between the parts receiver and the part held therein. It may be appreciated that among the parts which may be readily held by the elongated openings 44 are the wedges 40 and that, for example, either the pins 38 or the wedges 40 may be held in the circular openings 50. Furthermore, it may be appreciated that the cross-member 42 serves not only as a parts receiver but also acts as a stiffener for the frame 12.

[0029] Another type of parts receiver 30 useful in the present invention is a generally T-shaped brace 54 as shown in Figs. 1-5. The brace 54 as shown has a first wall 56 extending generally perpendicular to the face sheet 12 which includes openings 50 therein, and a second wall 60 oriented generally parallel to the face sheet 12. The openings 50 are shown as circular, but may be elongated or of other shapes to receive desired parts in complementary interfitting relationship. As shown in Figs. 1-5, some or all of the openings 50 may be provided with grippers 52, which frictionally engage the parts.

[0030] The brace 54 may be positioned between and welded to cross-members 42 as shown in Fig. 2 to provide structural reinforcement to the frame 14, stiffness to the face sheet 12, and to serve as a retaining member for the parts. It can also be positioned between adjacent stiffeners 28 as shown in Figs. 1 and 5. In these configurations, the second wall 60 serves to both reinforce the first wall 56 and to protect the parts received therein against unintended impact which may cause them to loosen and fall. In another configuration as shown in Fig. 1, the brace 54 can be placed with the second wall 60 against the back side of the face sheet 12 for ease of access to parts placed therein.

[0031] Fig. 6 shows a parts receiver 30 used in connection with the forming panel 10 which includes a strip 62 of one of hook and loop type material and another strip 64 of the other of the hook and loop type material attached to a part 37 such as a wedge 40. Such strips 62 may be attached to either the first bar 46 or the second bar 48 preferably by adhesive, or alternatively by a mechanical fastener. One example of a hook and loop type material useful for the strips is sold by McMaster-Carr of Chicago, Illinois as mushroom grip and loop fabric, the mushroom grip material being of

woven polypropylene with a polyester base as part number 94975K62, and the loop fabric provided as a knit nylon base with nylon napped loops as part number 94975K72. It may be appreciated that other types of hook and loop material may also be used for the strips, and that the hook or mushroom material may be applied to either the part or the parts receiver and the loop material would then be used with the other of the part and parts receiver.

[0032] Fig. 7 shows a parts receiver 30 used in connection with the forming panel 10 which includes a strip 66 of magnetic material. The strip 66 may be of magnetized metal such as iron, nickel or cobalt or alloys thereof, or ceramic magnets, or alternatively flexible magnetic material, and adhesive 58, welding or the like may be used to attach the strip 66 of magnetic material to the parts receiver 30. The parts 37 are typically of steel which permits easy magnetic releasable coupling of the part, such as wedge 40, to the strip 66 on the parts receiver 30. In addition, the grippers 52 may be of a magnetic material to further enhance retention of the parts 37 placed into an opening. Furthermore, the entire parts receiver 30 may be provided entirely of a magnetic material if desired.

[0033] Fig. 8 shows an alternate embodiment of the forming panel 10 with a parts receiver 30 wherein a flange 68 is provided on the first bar 56 which holds, by friction, a mechanical fastener, adhesive bonding or the like, a flexible gripper 70 to hold the parts 37. The flexible gripper 70 is shown as a strip 72 of steel bonded to the flange 68, but it may be appreciated that natural or synthetic rubber, aluminum or the like may be bonded to the parts receiver 30 and used for the strip 72. The part 37, such as wedge 40, may be tucked into the opening 74 behind the strip 72 which is opposed to the first bar 36, and thus held between the strip 72 and the first bar 36.

[0034] The forming panel 10 with the parts receiver 30 is especially convenient in use. The parts 37 may be temporarily stored in a complementally configured location on the parts receiver 30, and as shown in Figs. 3 and 4, differently shaped parts may be stored on the parts receiver 30 in different locations. For example, when a pin 38 or wedge 40 is to be stored, either may be placed in a circular opening 50. Alternatively, wedges 40 may be releasably held by the elongated openings 48 and the pins 38 may be held by the circular openings 50. More than one shape of opening may be provided, such that, for example, a cross-member 42 may include both elongated openings 48 and circular openings 50. The forming panel 10 may include only one type of parts receiver, or several as illustrated in Fig. 1. The parts receivers 30 are all positioned relatively remotely from the coupling sites so as not to interfere with storage and assembly of the forming panels 10 into a composite forming wall of several forming panels and associated forming structures. However, they are located on the forming panel so as to be readily accessible for use, such that when two such forming panels 10 are to be coupled together, it is easy to retrieve a pin 38, place it into the holes in the adjacent

forming panels, and insert the wedge 40 into the slot in the pin to couple the forms together. After use, the parts 37 may be returned to the parts receiver until needed for the next job. The provision of the grippers is useful for improving the frictional engagement between the parts receiver 30 and the parts 37, thus inhibiting loosening of the parts 37 placed therein but still permitting them to be
5 readily separated from use. Because the parts 37 are completely separate, a variety of differently configured parts may be held by a single forming panel 10, and may be moved to different forming panels 10 as the need arises.

THE EMBODIMENTS OF FIGS. 9-14

10 [0035] In the embodiments of Figs. 9-14, the forming panel 100 is identical to panel 10, except with respect to the retaining structure used to hold and store the loose parts. Panel 100 includes a face sheet 102 having a front side 104 (Figs. 10, 11, 13 and 14) and a backside 106 (Figs. 9, 10, 11, 13 and 14). In the illustrated embodiment, the retaining structure for loose coupling parts includes one or more brush rings 108 incorporated into an upright or vertical bracing and stiffening member 110. It will be appreciated, however, that rings 108 could also be incorporated into horizontal members 42 as in the embodiments of Figs. 1-8, or separate retainers such as the retainers 15 30 in Fig. 1 wherein the wall 60 thereof is secured directly to the backside 106 of face sheet 102 and the retainer does not serve a bracing or stiffening function. Member 110 may also extend horizontally between a pair of other upright bracing or stiffening members.

20 [0036] Member 110 is generally transversely Tee-shaped, having a wall 112 that intersects at right angles with a cross-head 114 at the mid-portion of cross-head 114. Preferably, member 110 comprises an extruded aluminum member. When used as a brace, member 110 is welded to the backside 106 of face sheet 102 with the edge of wall 112 opposite cross-head 114 abutting against backside 106. When member 110 is simply used as a separate holding device for the coupling parts 25 and not as a brace or stiffening member, the outer surface of cross-head 114 is abutted against backside 106 and welded thereto, with wall 112 projecting outwardly in a rearward direction from the cross-head 114 and face sheet 102.

[0037] Preferably, a pair of elongated mounting tracks 116 and 118 are provided on opposite sides of wall 112 for mounting brush rings 108 to member 110 in a manner as hereinafter described in more detail. Each track 116, 118 comprises a pair of generally L-shaped, longitudinally extending ribs 120 and 122 positioned in spaced, parallel opposition to one another and projecting laterally outwardly from wall 112. The distance between each pair of opposing ribs 120, 122 corresponds substantially to the outside diameter of the brush rings 108 and is preferably slightly undersized with

respect to such diameter. Likewise, the inturned legs 116a on ribs 120, 122 are spaced outwardly from wall 112 by a distance that substantially corresponds to and is slightly undersized with respect to the thickness of the brush rings 108.

[0038] Each of the brush rings 108 includes a transversely channel-shaped base 124 that is rolled into an annular configuration. Base 124 firmly retains a multiplicity of brush bristles 126 that project radially inwardly toward one another from base 124 and terminate in remote free ends that cooperate to define a receiving hole 128. Bristles 126 are preferably constructed from Nylon material and are looped around a length of binding wire 130 (Fig. 11) that is concentrically disposed within base 124. Base 124 has opposite sidewalls thereof crimped toward one another so as to firmly and securely retain the binding wire 130 and bristles 126 in place. Bristles 126 are resilient so as to perform an appropriate gripping and retaining function as hereinafter explained.

[0039] One type of brush ring which has been found to work well as a gripping and retaining device is available from Felton Brush Inc. of Londonderry, New Hampshire. A suitable brush ring from that supplier is identified as an internal type ring having an outside diameter of 1.25 inches, an inside diameter of .375 inches (the diameter of hole 128), Nylon bristles, a standard flat back channel (base 124) having a base width of .100 inches, a leg height of .125 inches, and, strip designation No. 2 1/2(A). The bristle diameter is .006 inches.

[0040] Wall 112 of member 110 has a series of circular openings 132 spaced along its length for cooperating with the holes 128 in brush rings 108 during retention of a coupling part such as the pins 134 illustrated in Figs. 9 and 13. Wall 112 includes a marginal portion 112a about the periphery of each opening 132 that is disposed to abut and bear against the base 124 of a brush ring 108 when the latter is installed in track 116 or 118 and the hole 128 of brush ring 108 is aligned with opening 132 in wall 112. As illustrated in particular in Fig. 11, opening 132 has substantially the same diameter as the inside diameter of base 124 of brush ring 108 so that, when ring 108 is aligned with hole 132, bristles 126 overlie opening 132 and are free to flex into the latter during gripping of a coupling part such as illustrated in Fig. 13, for example.

[0041] In a preferred form of the invention, the tracks 116 and 118 are so dimensioned relative to the brush rings 108 that rings 108 may be simply forced into the open end of one of the tracks, brought into proper registration with a selected opening 132, and then retained in place due to the wedging action between legs 120, 122 and the outside diameter of ring 108. Of course, if desired, each of the rings 108 may be welded in place or otherwise bonded to the wall 112 or ribs 120 and 122, but it has been found that due to the relatively soft nature of the aluminum material from

which member 110 is made, the rings 108 may usually be wedged tightly enough into place as to not require such additional fixing means.

[0042] As illustrated in Figs. 9 and 13 in particular, the brush rings 108 retain coupling parts such as a pin 134 by virtue of the bristles flexing adequately to allow insertion of the part in one direction while continuing to grip the part. When the part attempts to jostle loose in the opposite direction, the bristles tightly grip the part and resist an over-center flexing action that would permit the part to be withdrawn. Obviously, it is important for the hole 128 in the brush ring 108 to have a diameter that is less than the maximum transverse dimension of the part being forced into the brush ring. It may desirable in this respect to provide brush rings with different hole sizes along member 110 to accommodate differently dimensioned coupling parts.

[0043] Fig. 14 illustrates another embodiment of the invention in which a pair of the brush rings 108 may be disposed on opposite sides of each opening 132 in wall 112. This provides additional gripping strength and may or may not be necessary, depending upon the particular nature of the coupling parts being retained and stored on the member 110.

[0044] It is to be appreciated that the shapes of the openings and parts shown and described are illustrative only, and that a variety of different parts may be used with the forming panel.

[0045] Although preferred forms of the invention have been described above, it is to be recognized that such disclosure is by way of illustration only, and should not be utilized in a limiting sense in interpreting the scope of the present invention. Obvious modifications to the exemplary embodiments, as herein above set forth, could be readily made by those skilled in the art without departing from the spirit of the present invention.

[0046] The inventors hereby state their intent to rely on the Doctrine of Equivalents to determine and assess the reasonably fair scope of their invention as pertains to any apparatus not materially departing from but outside the literal scope of the invention as set out in the following claims.